



**SEATTLE CITY LIGHT WORK ORDER #90-6**  
**1990 SPRING MONITORING OF THE GEORGETOWN FLUME**

**Raven Services Corporation**

2200 Sixth Avenue, Suite 519, Seattle, Washington 98121 • (206) 443-1126 • FAX (206) 443-1128

**SCL 05390**

Lorton, Virginia • Anchorage, Alaska • Boulder, Colorado

**SEATTLE CITY LIGHT WORK ORDER #90-6**  
**1990 SPRING MONITORING OF THE GEORGETOWN FLUNE**

RAVEN SERVICES CORPORATION  
2200 SIXTH AVENUE, SUITE 519  
SEATTLE, WASHINGTON 98121  
(206) 443-1126; FAX (206) 443-1128

September 13, 1990

SCL 05391

## TABLE OF CONTENTS

	Page
I. INTRODUCTION	1
II. METHODOLOGY	1
III. RESULTS	4

## TABLES

- I. SAMPLE LISTINGS AND PCB CONCENTRATIONS
- II. SAMPLE DESCRIPTIONS

## FIGURES

1. VICINITY MAP, GEORGETOWN FLUME
2. SITE & SAMPLING POSITIONS, GEORGETOWN FLUME
3. LOCATIONS OF STEAM PLANT DITCH SAMPLES

SCL 05392

**SEATTLE CITY LIGHT WORK ORDER #90-6**  
**1990 SPRING MONITORING OF THE GEORGETOWN FLUME**

**I. INTRODUCTION**

The Georgetown Steam Plant Flume System is a watercourse that connects the inactive steam plant drain tunnel to Slip #4 in the Duwamish Estuary. In November 1985, PCB-contaminated sediments were removed from the Georgetown Flume System. PCB-contaminated soils in the catch basin area of the Steam Plant Yard were also excavated during the 1985 cleanup. In March 1987, the Boeing Company was given a 90-day notice of cancellation of its permit to dispose process cooling water into the flume. The permit was later revoked by City Light. The Boeing Company subsequently sealed the storm drain spouts and plumbing that discharged its cooling water into the flume. In April 1987, Raven Services Corporation undertook a project authorized by Seattle City Light Work Order #87-5 to determine if any new PCB contamination had reentered the system. This study was conducted to comply with a Department of Ecology [WDOE] order. Results of the 1987 study indicated that some recontamination of the flume system had occurred. Documentation and chronology of the recontamination of the flume system was presented in the report for Work Order #87-10, page 16. Additional flume monitoring occurred in July 1988, as authorized by Seattle City Light Work Order #88-12, to assess the extent of PCB contamination. In 1989, quarterly monitoring was authorized by Work Order #89-6, and consisted of spring, autumn and winter monitoring only. The quarterly monitoring program is scheduled to continue in the future until the flume is either closed or filled in.

The structure of the flume interior lining changes from concrete to wood in the downstream direction between the mouth of the double pipes and the tide gates. In 1989, an additional sampling project was initiated to determine the PCB concentrations inside the wood plank lining of the flume. Wood cores from planks north of Myrtle Street were collected and analyzed during autumn and winter monitoring. Additional sampling will continue and be completed during 1990. The current work order also involves reassessment of the PCB concentrations in the 1985 cleanup area. Sampling locations and results are shown in Figures 2 and 3. The spring monitoring, as authorized by Work Order #90-6, took place on 8 June 1990, during the late rainy season, and is reported here.

**SCL 05393**

## **II. SAMPLE METHODOLOGY**

### **A. Sampling Strategy**

In accordance with EPA SW-846, "Test Methods for Evaluating Solid Waste," a sampling strategy was chosen from sections most analogous to the nature of the site. These sections were 1.4.3 and 1.4.4. The sampling scheme for flume sediments consisted of a pattern of collection points established in 1987. The present sample locations were chosen consistent with that pattern. Wood cores were located to complete a pattern of wood samples that began at Myrtle Street and were collected upstream sequentially.

### **B. Container and Sampling Equipment**

All samples were placed in pre-cleaned, 270 ml wide-mouth glass containers. Screw cap lids were lined with aluminum foil. The precleaning procedure involved scrubbing with a special petrochemical dissolving soap [HarborMaster Products, Inc., Edmonds, Washington]. A final rinsing with methylene chloride was undertaken to remove any invisible greases and detergent residues.

Scoops were laboratory grade stainless steel. Before use, all tools were buffed free of rust, cleaned with petrochemical dissolving soap, and rinsed with methylene chloride.

### **C. Field Observations**

Data on the collection process and observations of the physical nature of the samples were kept in the bound field log book. The format for this book is chronological.

### **D. Sample Collection**

Method 8080 in the EPA SW-846 manual describes the protocol for handling organochlorine pesticides and polychlorinated biphenyls. Compliance with these instructions necessitated using glass containers and specified conditions for refrigeration. All samples in our case were delivered to the

laboratory in time to comply with the maximum seven days storage for extraction and thirty days for complete analysis.

Flume sediments were shallow, nominally 0-2 inches thick. A few sand berms were formed along the flume bottom by tidewater action, and a few were built up to several inches thick at the time of sampling. Where the flume sediments were less than 2" thick, the entire depth was collected in the subsample. Where the sediment thickness was greater than 2", the vertical extent of the subsample collected was 2". Since access to the sample sites was restricted by the wire heavy mesh across the top of the flume, a special device was used in the form of an 8 cm stainless steel spoon bent to a 90° angle and attached to a 1/2" diameter 7' long stainless steel pipe. The spoon was ferreted through holes in the mesh and used as a scoop against the floor of the flume. Sediment samples in the cleanup area along the drainage ditch connecting the firepit to the storm drain were 0-2" on top of the plastic tarp. Compositing was accomplished in a stainless steel 30 cm diameter mixing bowl.

Wood cores were specified for this project. Raven has devised a corer that can sample any of the wood floor locations. The corer consists of a steel punch, 5/8" in diameter and nine feet long. Threads at the bottom of the punch allowed the corer to be screwed out from the planks after it had been hammered in. A slot was cut 2-1/2 inches above the bottom of the core nose to facilitate sample removal. The device resembles a giant leather punch, and removed a core 1" long. Care was taken not to punch through the planks. Sampling locations are shown in Figure II.

#### **E. Analysis**

Samples, stored no longer than five days at 4° C, were extracted with methylene chloride and taken up with pesticide grade hexane. Samples were pre-treated with Florisil filters to remove residues that interfere with the PCB determination [cleanup modification of USEPA Method 3540, as specified by 40CFR136]. The samples were analyzed by a modification of the packed column gas chromatography procedure described in Method 3550 using a

capillary column. The automated gas chromatograph [Waters Corp Dimension-1] with electron capture detector was used. Concentrations below 0.01 ppm are below the detection limit.

### III. RESULTS

Temperatures, as recorded with the  $\pm 0.05$  C immersion thermometer were air: 19.4°C; water in the flume head: 19.5°C; water at double pipes head: 19.3°C. State of the tide was zero feet referenced to Seattle Tides. The flume had been emptying of tidewater since 4:00 a.m. The tide began to rise from -1.7 feet at 11:43 a.m.

The PCB results are listed by Aroclor in Table I and PCB concentrations in the flume are shown in Figure 2. One composite sample from the flume head near the tunnel entrance contained 33.9 ppm; near the mouth of the flume head, 1.5 ppm was found. In the composite of four subsamples above the tidegates, 0.3 ppm was found. The other composites including the Slip #4 sample displayed no detectable PCB signals. The wood cores also displayed no detectable PCB signals.

By comparison, in the winter report for W.O. #89-6, Table I showed 9.6 ppm in the flume head sediment, and 5.8 ppm in the double pipe head sediment. A wood core below the tidegates was reported to contain 1.4 ppm.

Soil and sediment samples gathered in the Steam Plant yard for this monitoring period are also listed in Table I. The sample locations are plotted in Figure 3. Of the three composites collected, only the site of the old catch basin contained sediments with detectable PCBs (7.2 ppm). A physical description of all the samples in this study is provided in Table II.

SEATTLE CITY LIGHT WORK ORDER #90-6  
1990 SPRING MONITORING OF THE GEORGETOWN FLUME  
SAMPLE LISTINGS

TABLE I

<u>Sample #/ # Subsample</u>	<u>Location</u>	PCB Concentration (ppm)	PCB Concentration (ppm)	PCB Concentration (ppm)
		Aroclor 1254	Aroclor 1248	Total
GS-1 /2	Flume head	28	5.9	33.9
GS-2 /1	Flume head	1.0	0.5	1.5
GS-3 /2	Double pipe head	<0.1	<0.1	<0.1
GS-4 /4	Above tidegates	0.2	0.1	0.3
GS-5 /4	Below tidegates	<0.1	<0.1	<0.1
GS-10 /2	Willow St. Bridge	<0.1	<0.1	<0.1
GS-11 /1	Slip #4	<0.1	<0.1	<0.1
GS-6 /wood	Below tidegates	<0.3	<0.3	<0.3
GS-7 /wood	Above tidegates	<0.3	<0.3	<0.3
GS-8 /wood	Above tidegates	<0.3	<0.3	<0.3
GS-9 /wood	Willow St. (blank)	<0.5	<0.5	<0.5
GS-12 /3	Old catch basin	7.2	<0.1	7.2
GS-13 /3	Central area of "ditch"	<0.1	<0.1	<0.1
GS-14 /3	East end of "ditch"	<0.1	<0.1	<0.1

SCL 05397



SEATTLE CITY LIGHT WORK ORDER #90-6  
1990 SPRING MONITORING OF THE GEORGETOWN FLUME  
SAMPLE DESCRIPTIONS

TABLE II

<u>Sample #/ # Subsample</u>	<u>Location</u>	<u>Description</u>
GS-1 /2	Flume head east end, four feet from barrier	2" deep sediments of yellow-brown sand above oily black anerobic mud. Water not clear about 8 inches deep.
GS-2 /2	Flume head west end, two feet from drain	1" of brown mud above 1" of black sand supporting weed-like grass 1" long.
GS-3 /2	Double pipes head	Almost totally humus of decayed leaves. Black and grey sediment 2" deep and littered on top with fast food containers.
GS-4 /4	Above tide gates	Upstream: black humus and clay, brown clay and decayed leaves to 2" thick. Downstream: some construction sand swirled by tides into berms, 0 - 3" thick.
GS-5 /4	Below tide gates	Upstream: gray and black humus leaves in fine clay/sand 1 - 2" thick. Downstream: fine sandy berms to 3" thick running into brown mud.
GS-10 /2	Willow St. bridge	Upstream: fine blue and black silt and humus about 2" thick. Downstream: construction sand berms 2 - 4" thick.
GS-11 /2	Slip 4	Subsamples were taken 6' south of the outfall, 2' apart. They were 1/8" of gray mud over blue-black oily anerobic silt.
GS-6 /wood	Twenty feet below tide gates near north wall	Grey soft wood with grain intact
GS-7 /wood	Flume center one foot above tide gates	Firm wood, green and red-streaked

SCL 05398

<u>Sample #/ # Subsample</u>	<u>Location</u>	<u>Description</u>
GS-8 /wood	Above tide gates 19.6 feet at upstream end of wood construction	Chunky decayed wood of straw color
GS-9 /wood	(blank) top of flume sidewall near bridge	Gray-colored weathered but with grain intact
GS-12 /3	Ditch, west end	Shallow rooted weeds growing on top of clean brown fill sand; subsamples collected 0 - 3" deep.
GS-13 /3	Ditch, center area	Areas above stagnant water have curled mud. Areas below have decayed leaves over fill sand; subsamples collected 0 - 2" deep.
GS-14 /3	Ditch, east end	Yellow and green mold on top of dark brown sand and semi-decayed leaves; subsamples collected 0 - 2" deep.

SCL 05399

CTY0050305

SEA290776

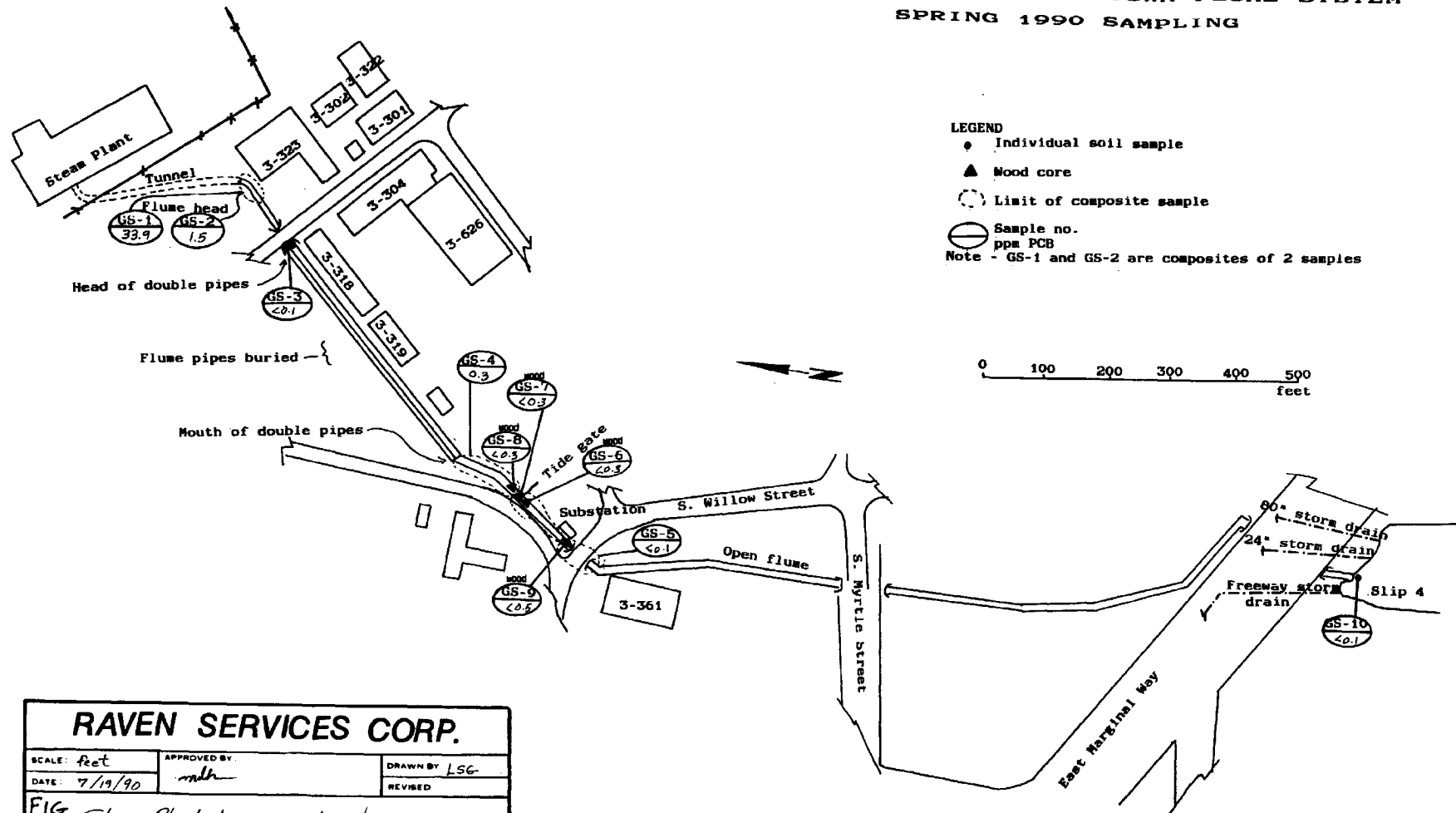
The map shows a dense grid of streets in Denver, Colorado. Major streets like Broadway, Colfax, and Larimer are visible. The Georgetown Steam Plant is marked with a star in the southeast. The Denver International Airport is shown in the south. The map also includes labels for various parks and landmarks, such as Jefferson Park and the Denver Water Plant. A star is placed on the map near the Georgetown Steam Plant, which is located in the southeastern part of the city. The map also shows the location of the Denver International Airport and the Denver Water Plant.

Reproduced with permission granted by Thomas Bros. Repts. This  
map is copyrighted by Thomas Bros. Repts. It is unlawful to copy,  
reproduce all or any part thereof without the written consent of  
P.O. Box 1, Milwaukee, WI 53201.

RAVEN SERVICES CORPORATION		
SCALE: 1" = 2560 ft	APPROVED BY: <i>mlu</i>	DRAWN BY LSG
DATE: 6-27-90		REVISED LSG
<p align="center"><b>FIG 1</b></p> <p align="center">SW GEORGETOWN DISTRICT</p>		
SEATTLE CITY LIGHT		DRAWING NUMBER 90-6(1)-1

SEA290777

SCL - GEORGETOWN FLUME SYSTEM  
SPRING 1990 SAMPLING



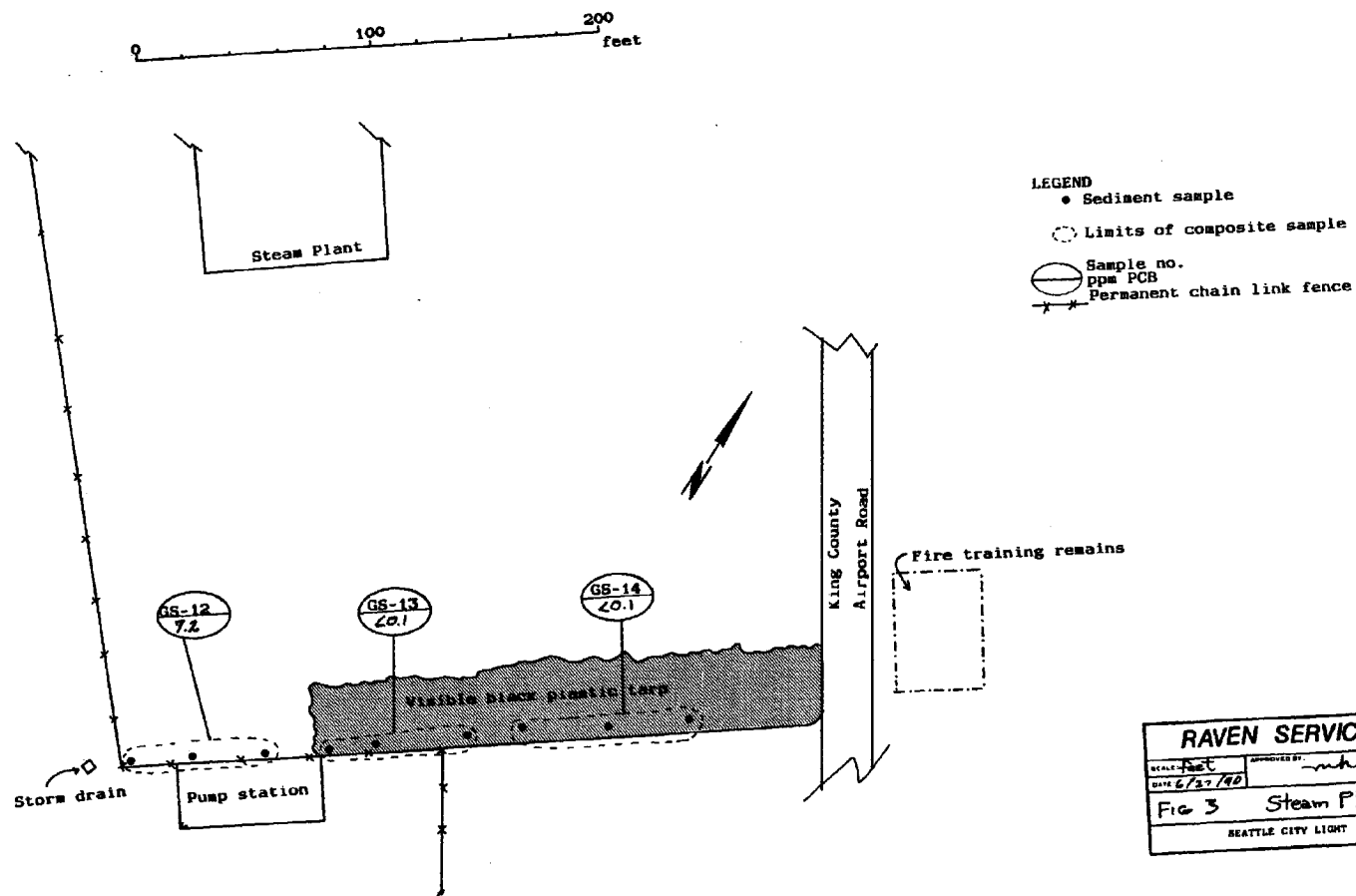
RAVEN SERVICES CORP.		
SCALE: feet	APPROVED BY: <i>mlh</i>	DRAWN BY: LSG
DATE: 7/19/90		REVISED:
FIG 2 Steam Plant & Flume Locations		
SEATTLE CITY LIGHT		DRAWING NUMBER: 90-601-2

SCL 05401

CTV0050307

SEA290778

SCL - GEORGETOWN STEAM PLANT DRAINAGE DITCH  
 SPRING 1990 SAMPLING



SCL 05402

RAVEN SERVICES CORP.			
SCALE: Feet	APPROVED BY: <i>mh</i>	DRAWN BY: LSG	
DATE: 6/27/90	REVIEWED:		
FIG 3 Steam Plant Yard			
SEATTLE CITY LIGHT			90-601-3

CT70050308

SEA290779